ORIGINAL ARTICLES

From the Eastern Vascular Society

Presidential address: Practice patterns in vascular surgery—Implications for the certification and training of vascular surgeons

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It is a privilege for me to welcome you to the Eleventh Annual Meeting of the Eastern Vascular Society (EVS). Serving as President of your Society during this past year has been a great pleasure and distinct honor for me. As I contemplated the traditional obligation for this address, I was impressed with the emergence of our specialty of vascular surgery to a position of independence, as well as the gravity of decisions and crossroads we face moving toward the next century. Today, I have chosen to review a body of data that impacts on the practice of vascular surgery and the training of vascular surgeons. In preparing for this presentation, I have used data previously collected for the Association of Program Directors in Vascular Surgery (APDVS; Manpower survey. Hobson RW, unpublished data; 1995-96.). I have been urged by many colleagues to publish this information, and I trust that it will interest you as well as constitute a useful review for those of you in the audience who attended recent meetings of the APDVS. In my opinion, these data reflect ongoing changes in the practice of vascular surgery and have important implications for the certification and future training of vascular surgeons.

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DATA COLLECTION

A questionnaire (Fig. 1) was distributed in 1994 and 1995 by the APDVS to graduates of fellowship programs in vascular surgery during the period 1985 to 1995. The years of fellowship training were recorded, and caseloads for vascular and general surgical procedures were determined and analyzed. The record of certification by the American Board of Surgery (ABS) and societal memberships achieved by recent graduates were summarized. Definitions of a vascular specialist in terms of varying vascular surgical caseloads were described. Completed questionnaires were received from 420 fellowship graduates (70%) from an estimated 600 graduates over the prior 10 years. Although 78 programs currently are approved by the Residency Review Committee (RRC)–Surgery, these respondents had graduated from 64 of 71 approved programs at that time. The purpose of this questionnaire was to supplement data published by Stanley and colleagues[1] from the Committee on Workforce Issues, Joint Council of The Society for Vascular Surgery (SVS) and the International Society for Cardiovascular Surgery, North American Chapter (ISCVS-NA). These authors analyzed questionnaires from 1406 surgeons (57% of questionnaires sent to 2732 vascular surgeons) who were members of the national, regional, or local vascular societies.

Finally during the last year, data from the ABS were analyzed for surgeons who were seeking recertification after 10 years of practice (Ritchie WP, the American Board of Surgery; personal communication, 1995-96). Recognizing that the first examinations for the Special Certificate of Competency in Vascular Surgery were administered by the ABS in 1983, these data from 1995 represent a reasonable

APDVS QUESTIONNAIRE

1. **Vascular Residency program? _____.**
   Year Vascular Residency Training completed? ____.

2. **In 1994, for how many vascular operations (arterial reconstructive procedures, embolectomies, endarterectomies, vascular injury repairs, angioaccess procedures, portosystemic shunts, and venous reconstructions) were you the surgeon of record?**

   ___ 0-9
   ___ 10-19
   ___ 20-29
   ___ 30-39
   ___ 40-49
   ___ 50-59
   ___ 60-69
   ___ 70-79
   ___ 80-89
   ___ 90-99
   ___ 100-125
   ___ 126-149
   ___ 150-175
   ___ 176-199
   ___ 200-250
   ___ >251 Insert number ___

3. **What percentage of your total operative caseload were vascular operations as defined in question 2? ___%**

4. **In 1994, for how many of the ten following operations (exact number) were you the surgeon of record?**

   _____ Extremity vessel bypass
   _____ Carotid endarterectomy
   _____ Abdominal aortic aneurysmectomy
   _____ Aorto-iliac/femoral bypass
   _____ Angioaccess
   _____ Inguinal herniorrhaphy
   _____ Cholecystectomy
   _____ Appendectomy
   _____ Colectomy/Gastrectomy
   _____ Hepatic/pancreatic resection

5. **In your opinion, how many "vascular operations" (defined in question 2) should a surgeon perform per year to be termed a "vascular specialist"?**

   _____ At least 25
   _____ At least 50
   _____ At least 75
   _____ At least 100
   _____ Greater than 100

6. **Should vascular surgical privileges be restricted to those surgeons who fulfill your definition of a "vascular specialist"?**

   _____ Yes **_____ No**

7. **Member of**
   _____ SVS
   _____ ISCVS - North American Chapter
   _____ Regional vascular society
   _____ Certified by ABS in Vascular Surgery

Fig. 1. APDVS questionnaire directed to graduates of fellowship programs in vascular surgery, 1985 to 1995.

cross-section of information from well-established surgeons who currently practice and are certified by the ABS.

PRACTICE PATTERNS

The results of the APDVS questionnaire define current practice patterns of recent graduates in the United States. Of the respondents (Fig. 2), 306 (73%) had graduated since 1990. This reflects the increasing numbers of approved programs in the late 1980s and early 1990s. Of the 420 respondents, 260 (62%) had gained certification by the ABS with Special Certificates of Competency in Vascular Surgery or Certificates of Added Qualifications, 175 (42%) were members of regional vascular societies, 60 (14%) were members of the ISCVS-NA, and 12 (3%) were members of the SVS (Fig. 3).

Case volumes in vascular surgery as submitted by the respondents are presented in Fig. 4. Approximately 70% of the graduates performed 100 or more major vascular procedures annually, the mean number of cases being 144. Of the vascular surgical caseload (144 cases), the mean number of recorded cases (Fig. 5) were as follows: extremity bypass, 46 cases (32%); carotid endarterectomy, 30 cases (21%); abdominal aortic aneurysm repair, 18 cases (12.5%); aortoiliac-femoral bypass, 12 cases (8%); and angioaccess procedures, 38 cases (26%). Of the general surgical case volume (34 cases), the mean number of recorded cases (Fig. 6) were as follows: inguinal herniorrhaphy, nine cases (26%); cholecystectomy, 12 cases (35%); appendectomy, six cases (18%); colectomy/gastrectomy, six cases (18%); and hepatic/pancreatic resection, 0.5 cases (1.5%). Of all cases, 81% were vascular surgical procedures and 19% were general surgical procedures.

Regarding the definition of a "vascular specialist" (question 5, Fig. 1), 92% of respondents suggested

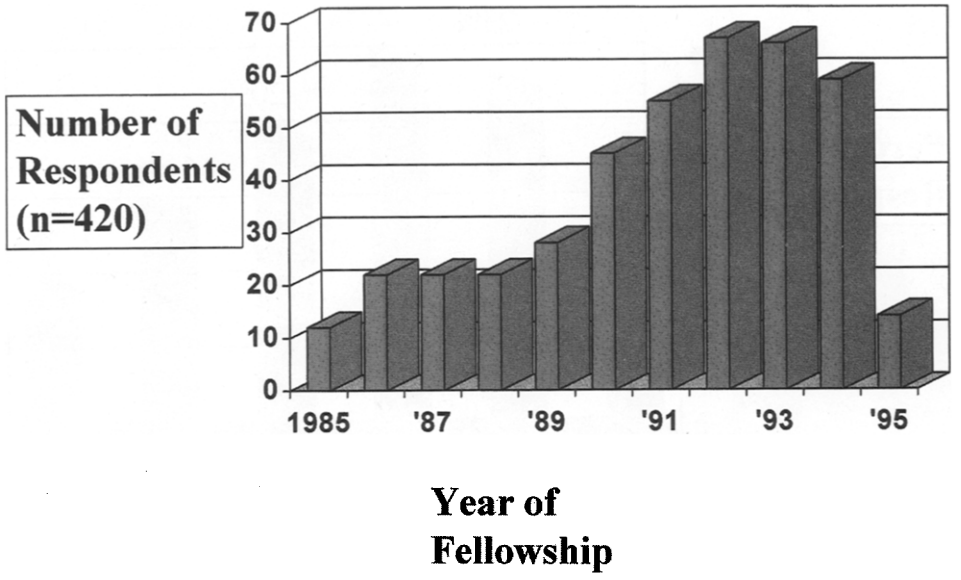

Fig. 2. Number of graduates from each year of fellowship who responded to the APDVS questionnaire.

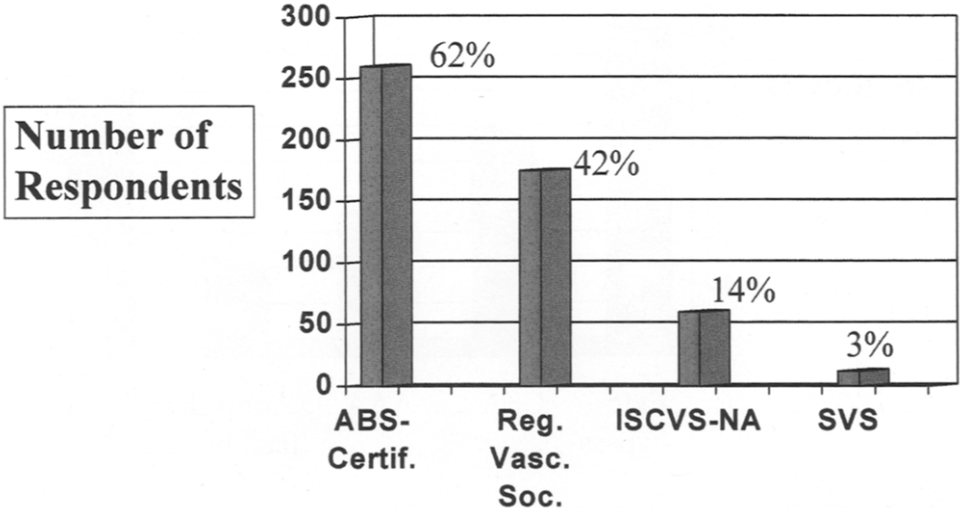

Fig. 3. Incidence of certification by the ABS and societal memberships achieved by graduates.

that an annual case volume of at least 50 or more cases was necessary. However, 30% of respondents recommended a caseload of 100 cases or greater than 100 cases per year. More than 90% of the respondents thought that privileges in vascular surgery should be restricted to those surgeons who fulfilled the definition of a "vascular specialist."

Data from the ABS's recertification examination were analyzed for 1995. Surgeons were categorized into one of three groups (Table I). Significant differences were noted between each of the groups and their mean case volumes in vascular and general surgical procedures (Table II). Vascular diplomates who were taking vascular recertification examinations performed 81% of their total caseload in vascular surgical procedures, and vascular diplomates who were taking the general surgical recertification examination performed 55% of their caseload in vascular surgical procedures, whereas general surgery diplomates without certification in vascular surgery who took general surgical recertification examinations performed only 12% of their case volume in vascular

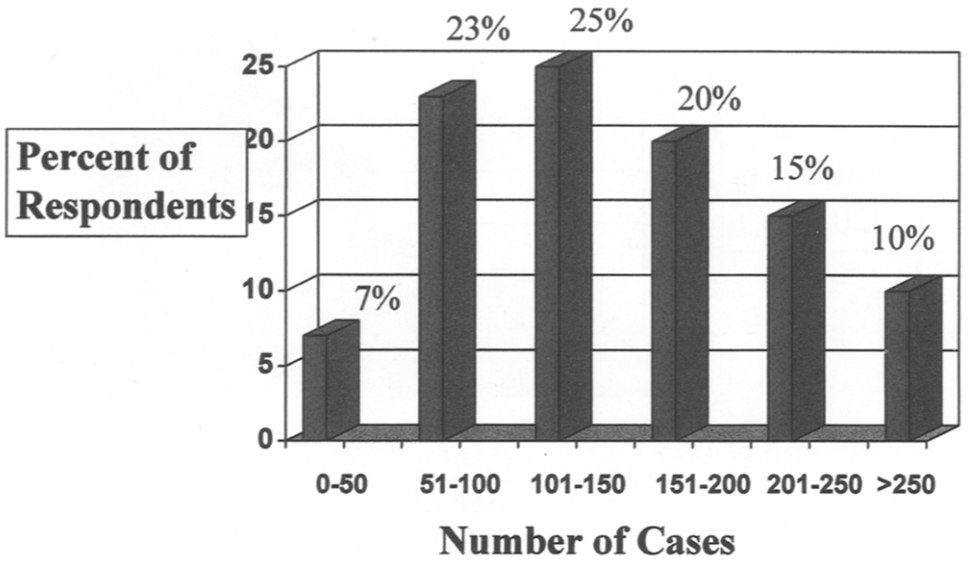

Fig. 4. Vascular surgical volume categorized by total number of cases performed (1994-95).

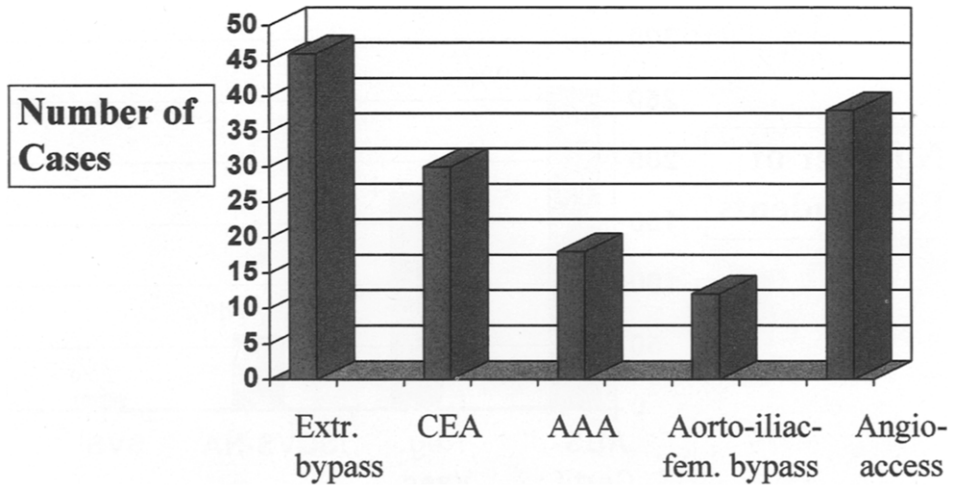

Fig. 5. Vascular surgical cases performed by graduates (mean number of cases, 1994-95).

surgical procedures ($p < 0.05$). For surgeons in each of the three groups, the mean number of cases for each surgeon, as well as the number of cases at the 90th percentile of each group, are presented (Tables III and IV). Comparable numbers of vascular surgical procedures were performed by surgeons in groups 1 and 2 (Table III), whereas surgeons in group 3 performed small numbers of procedures with the exception of angioaccess. Surgeons in group 1 performed a significantly lesser volume of general surgical procedures, whereas those in group 2 performed an intermediate number of cases, and surgeons in group 3 performed the largest number of general surgical cases (Table IV).

DISCUSSION

Results from the fellowship questionnaire reflect practice patterns of recent graduates and demonstrate remarkable similarity to data generated by the manpower survey conducted by the Joint Council[1] (Table V). The mean annual vascular case volume for SVS and ISCVS-NA members in 1992 was 144, identical to the APDVS data. Of their total caseloads, the percentage of vascular surgical cases was also

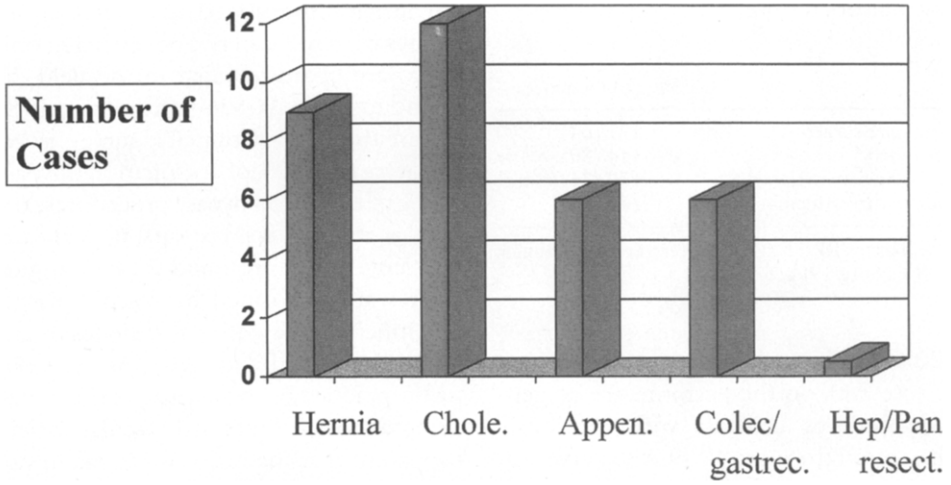

Fig. 6. General surgical cases performed by graduates (mean number of cases, 1994-95).

Table I. Groups of surgeons: recertification examination (ABS, 1995)

Group 1	Vascular Diplomates with Special and Added Qualifications taking Vascular Recertification Examinations (n = 87)
Group 2	Vascular Diplomates taking General Surgery Recertification Examinations (n = 90)
Group 3	General Surgery Diplomates without Certificates in Vascular Surgery taking General Surgery Recertification Examinations (n = 685)

Table II. Mean case volumes: vascular and general surgical procedures performed by surgeons recertifying for ABS, 1995

Groups (Table I):	*1*	*2*	*3*
Number of surgeons in each group	87	90	685
Mean operations/year	274	352	381
Mean vascular operations*	197	192	41
Mean general surgical operations*	77	160	340
% vascular operations*	81	55	12
% general surgical operations*	19	45	88

*Case volumes and percentages of total cases are significantly different between groups, $p < 0.05$.

Table III. Vascular surgical procedures per year: ABS, 1995

	Groups		
Operations	*1*	*2*	*3*
Elective AAA	11 (24)	10 (19)	1 (4)
Emergent AAA	2 (5)	2 (3)	<1 (1)
Carotid endarterectomy	34 (64)	32 (69)	3 (11)
Aortoiliac occlusive	9 (18)	9 (21)	1 (3)
Lower extremity bypass (fem/pop/tib)	39 (75)	31 (67)	3 (8)
Angioaccess	38 (87)	51 (135)	20 (54)

Values given are means, with 90th percentile in parentheses.
AAA, Abdominal aortic aneurysm.

Table IV. General surgical procedures per year: ABS, 1995

	Groups		
Operations	*1*	*2*	*3*
Inguinal/femoral hernia	6 (19)	15 (45)	33 (72)
Cholecystectomy	6 (27)	19 (60)	41 (95)
Appendectomy	3 (7)	5 (24)	14 (33)
Mastectomy	2 (5)	2 (7)	7 (15)
Colectomy	3 (12)	6 (22)	12 (26)
Pancreatectomy	<1 (1)	<1 (1)	1 (2)
Hepatectomy	<1 (1)	<1 (1)	2 (5)

Values given are means, with 90th percentile in parentheses.

similar, at 75% and 81%, respectively (Table V). Although the largest annual volume of cases was recorded among ABS-certified vascular surgeons[1] who completed their fellowships between 1971 and 1980 (183 cases), the more recent graduates established sizeable practices in a relatively small number of years, probably related to their membership in surgical groups. Also, recent graduates performed a mean volume of 34 general surgical cases. Although 58% of recent graduates performed 50 or more general surgical procedures in their case volumes, 30% of graduates performed 10 or fewer general surgical proce-

Table V. Vascular operations performed annually

	No. (% of practice)
ABS-certified vascular surgeons*	171 (64)
SVS/ISCVS members*	144 (39)
Regional Vascular Society members*	100 (75)
APDVS manpower survey members	144 (81)

*From: Stanley JC, Barnes RW, Ernst CB, Hertzer NR, Mannick JA, Moore WS. J Vasc Surg 1996;23:172-81.

dures and 20% performed no general surgical procedures. These data on the performance of general surgical procedures contrast with previously published information from the 1989 ABS survey on initiates to the American College of Surgeons (ACS) conducted by Wheeler.[2] Only 10% of ACS initiates identified as vascular surgeons with certificates of special competency or added qualifications performed 10 or more general surgical procedures.[2] This altered practice pattern may reflect the growing number of vascular surgeons who join surgical groups and are asked to cover practices that include performance of some general surgical procedures. It also emphasizes the need for a substantial number of vascular surgeons to retain certification in general surgery, notwithstanding the independent nature of a practice of vascular surgery.

The additional information from the ABS demonstrates that of the vascular surgical cases, only angioaccess is performed by general surgery diplomates in any substantial volume (group 3; Table III). Furthermore, the case distribution among vascular diplomates who were taking the vascular recertification examination (group 1; Table II) was 81% vascular and 19% general surgical procedures, whereas vascular diplomates who were taking the general surgical recertification examination (group 2; Table II) demonstrated a 55% and 45% distribution in cases, respectively. Surgeons in group 2 represented a unique segment of practitioners who performed substantial numbers of general and vascular surgical procedures. However, this group represented only about 10% of the candidates for recertification. General surgeons who were recertifying in general surgery performed only 12% of their caseloads in vascular procedures. The annual mean volume of vascular surgical cases for general surgery diplomates included only one elective abdominal aortic aneurysm, less than one emergent abdominal aortic aneurysm, three carotid endarterectomies, one aortoiliac revascularization, three lower limb bypass procedures, and 20 angioaccess procedures (Table III). Although Wheeler[2] emphasized that vascular surgical procedures currently can not be restricted only to surgeons who are board-certified in the field, his survey was conducted on ACS initiatives from 1989. When data from the Joint Council's survey is considered,[1] it appears that 80% of aortofemoral bypass procedures, 97% of extremity bypass procedures, 68% of abdominal aortic aneurysm repairs, 64% of carotid endarterectomy procedures, and 72% of angioaccess procedures are performed by vascular surgeons who are members of the national societies, regional societies, or are certified by the ABS. As more senior surgeons who practice both vascular and general surgery and are members of regional vascular societies retire, it is apparent that the major workload in vascular surgery will be assumed by vascular surgeons who are certified by the ABS and are members of the SVS or ISCVS-NA. Although the ABS continues to consider vascular surgery as a component of a practice in general surgery, practice data from this report confirm the distinctive nature of the specialty of vascular surgery as practiced by surgeons certified by the ABS.

The emergence of vascular surgery as a specialty of surgery has been confirmed by an analysis of these new practice data. This information complements previously published reports by Wheeler,[2] as well as Stanley and colleagues.[1] Sheldon[3] has also expressed a similar opinion. He outlined the historical development of the vascular fellowship and the assumption by the RRC of supervision for the accreditation of fellowships in vascular surgery. However, he also emphasized that the establishment of a separate RRC in vascular surgery that would report directly to the Accreditation Council on Graduate Medical Education was a feasible alternative. This is further supported by the recommendation from Barnes[4] that general surgery also should receive specialty designation. In this way, the development of curricular-based training programs for each specialty can be approached rationally, so as to maintain current objectives of excellence in patient care while simultaneously avoiding the emotionally charged issue of "fragmentation" in surgical practice. As Pories and Aslakson[5] have emphasized, "the times of the compleat general surgeon are gone." However, the identification of general surgery as a critically important specialty for the year 2000 and thereafter emphasizes the urgency of defining curricular-based programs. The Association of Program Directors in Surgery (APDS) and the APDVS can play important roles in defining these programs and thereby assist the RRC and ABS in their activities. On the basis of current practice data from this report, residents in general

surgery should be entirely familiar with the management of vascular trauma, catheter-based and operative interventions for angioaccess, venous surgical procedures to include vena caval interruption, management of deep venous thrombosis, and venous reconstructive procedures as well as amputation procedures. Familiarization but not clinical competency would be recommended for the index vascular cases, such as repair of abdominal or thoracoabdominal aortic aneurysms, lower extremity bypass procedures, carotid endarterectomy, bypass grafting or endarterectomy for aortoiliac occlusive disease, as well as performance of emerging endovascular surgical procedures. These latter areas would be designated as the primary responsibility of those surgeons who specialize in vascular surgery. In addition, precise knowledge would be required of these trainees in the noninvasive diagnosis of vascular disease. This next generation of surgical residency programs, as reviewed by Barnes,[4] will be based on several assumptions: most surgical residents seek specialty training and certification; general surgery should be recognized as a specialty; and erosion of the current "pillars of general surgery" reflects in part the failure of broad-based competence in the face of focused expertise. Finally, a curricular-based program with development of a 5- or 6-year early tracking to vascular surgery, advanced general surgery, or other specialty areas will create advantages for surgical education.

Recently, Barnes and Ernst[6] collected data from Program Directors in General Surgery (SPDs) and Program Directors in Vascular Surgery (VPDs) regarding vascular surgical training. These authors compared data from 1987 and 1988 with the most recent information from 1995. Attitudes have changed regarding the training of vascular and general surgeons. Fewer than 20% of VPDs concluded that general surgeons should be granted unrestricted hospital privileges in vascular surgery. However, SPDs registered a decline in their opinion that general surgeons should receive unrestricted vascular surgical privileges from 71% in 1987 to 88 to only 47% in 1995. These data are entirely consistent with the changing practice patterns documented in this report. Whereas both groups supported the value of fellowship training in their programs, both groups also suggested that early tracking of residency programs would be valuable, particularly if the federal government limits funding of graduate medical education to 5 years. Some differences existed in recommendations for a program based on a 5-year residency. SPDs tended to prefer 3 years of general surgery and 2 years of vascular surgery, whereas VPDs favored four years in general surgery and 1 year of vascular surgery. Recognizing that retention of board certification in general surgery is required by many graduates of vascular surgical training programs, the 4-year program in which components of a Chief Residency in General Surgery are developed within the PGY-4 year, whereas using most of the PGY-5 year for specialty training in vascular surgery or advanced general surgery would be desirable. Although current RRC rules would allow pilot programs of this type to be initiated, current rules of the American Board of Medical Specialties preclude dual certification for the same period of training. That these rules and regulations will need to be reassessed is obvious, and flexibility in these deliberations will be required.

COMPROMISE/RECOMMENDATIONS

The concept of a curricular-based program of residency training in vascular surgery and general surgery will become a reality. Thoughtful surgical educators[4-7] have recommended these changes, including a program of early tracking to achieve specialty training, during the last several years. Under the leadership of Dr. Robert Barnes, current President of the Association of Program Directors in Surgery (APDS), representatives from the APDS (Drs. Aufses, Barnes, Dent, and O'Leary) met with members of the Council of the APDVS (Drs. Cronenwett, Hobson, Porter, and Towne) in February 1997 in Atlanta. Although a substantial amount of effort will be required to complete curricular descriptions for these programs, I was impressed with the collegiality of the two groups and the willingness of the groups to consider an early tracking program, even if a funding limit of 5 years for graduate medical education were mandated by the federal government. Consequently, I am optimistic about the prospects for developing the curricular-based programs and early tracking systems in surgical education. Formal certification will follow for vascular surgery.

Much of the discussion regarding the specialty of vascular surgery has been stimulated by a recent letter from the Joint Council and Council of the APDVS published in the *Journal of Vascular Surgery*,[8] which outlined a rationale for establishment of the American Board of Vascular Surgery and solicited support from the membership. Although this is a preferred option, it is acknowledged that approval by the American Board of Medical Specialties (ABMS) will be a formidable task. Establishment of a separate RRC-Vascular Surgery, however, would be a desir-

able feature. As another option, whether or not separate specialties in vascular surgery and general surgery can be supported by the ABS and lead to separate RRCs remains to be discussed by the regulatory bodies. It would appear that recognition of general surgery as a specialty would pave the way for separate RRCs. This might even be considered as a template for other specialties such as surgical oncology, critical care, hand surgery, pediatric surgery, trauma, or organ transplantation. The concept of receiving a certificate in surgery with special recognition or major in one of these fields becomes attractive and potentially would maintain the "family of surgery" with its multiple specialties, including vascular surgery and advanced general surgery.

These proposals and others will be debated at great length during the next several years. However, the primacy of a practice in vascular surgery has been established, which ultimately should lead to appropriate decisions regarding the certification and training of vascular surgeons. The ABS[9] formally has expressed its opposition to the establishment of the American Board of Vascular Surgery as well as a separate RRC-Vascular Surgery. However, that this and other options still exist is encouraging. I submit that the EVS will play a role in these decisions. We constitute the consensus that the Joint Council and the Council of the APDVS seek. Data from questionnaires sent to you concerning establishment of the American Board of Vascular Surgery will be forwarded to the Joint Council. The EVS Council has recommended that similar data should be collected from other regional vascular societies. However, a knowledge of current practice patterns in vascular and general surgery lead the way to rational decisions that will benefit our specialty and the patients we serve.

The author wishes to express his appreciation to Wallace P. Ritchie, Jr., MD, Executive Director, the American Board of Surgery, Philadelphia, for his efforts in reviewing the data on recertification of surgeons by the ABS, 1995.

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